



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/605,306

09/22/2003

SHIH-FAN KUAN

11516-US-PA

2305

31561

7590

10/19/2004

JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE

7 FLOOR-1, NO. 100

ROOSEVELT ROAD, SECTION 2

TAIPEI, 100

TAIWAN

EXAMINER

SMOOT, STEPHEN W

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/605,306

Applicant(s)

KUAN ET AL.

Examiner

Stephen W. Smoot

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003 and 09 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office action is in response to application papers filed on 22 September 2003 and to applicant's election received on 09 September 2004.

Election/Restrictions

1. Applicant's election of Group I, claims 1-13, and cancellation of non-elected claims 14-19 in the reply received on 09 September 2004 are acknowledged.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Method of Manufacturing a Semiconductor Device Featuring the Formation of Conductive Plugs in Openings Formed Between Conductive Structures.

3. The disclosure is objected to because of the following informalities:

In paragraph [0023], line 1, change "215" to --216-- because the photoresist layer is designated as reference number 216 in Fig. 2B (also see paragraph [0022]);

In paragraph [0024], line 2, change "228" to --226-- because the liner material layer is designated as reference number 226 in Fig. 2C (also see paragraph [0023]);

In paragraph [0025], line 5, change "333" to --222-- because the funnel-shaped opening is designated as reference number 222 in Figs. 2B-2D, 2F (also see paragraph [0022]);

In paragraph [0027], line 11, change "228" to --228a-- because the bottom plug is designated as reference number 228a in Figs. 2E, 2F, 3 (also see paragraph [0027], lines 6, 10); and

In paragraph [0028], line 5, change "212" to --208-- because the cap layer is designated as reference number 208 in Figs. 2A-2F (also see paragraph [0021]).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "the sidewalls" in line 8;

Claim 1 recites the limitation "the open end" in line 19;

Claim 4 recites the limitation "the shoulder section" in lines 3-4;

Claim 4 recites the limitation "the sidewalls" in line 8;

Claim 9 recites the limitation "the sidewalls" in line 8;

Claim 9 recites the limitation "the sidewalls" in line 16; and

Claim 11 recites the limitation "the step of forming a funnel shape opening" in lines 1-2.

There is insufficient antecedent basis for these limitations in claims 1, 4, 9, 11.

Claim 1 does not particularly point out if a portion of the spacers or the entire spacers are being removed (see lines 10-13).

Claim 3 does not particularly point out if a portion of the spacers or the entire spacers are being removed (see lines 2-4).

Claim 9 does not particularly point out if a portion of the spacers or the entire spacers are being removed (see lines 10-13).

Claim 11 does not particularly point out if a portion of the spacers or the entire spacers are being removed (see lines 2-4).

Claims 2-8 are rejected under 35 U.S.C. 112, second paragraph, because they depend on claim 1.

Claims 10-13 are rejected under 35 U.S.C. 112, second paragraph, because they depend on claim 9.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3, 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka (US 2002/0105089 A1).

Referring to Figs. 16A-16F, 17A-17F, paragraphs [0113] to [0119], and paragraphs [0169] to [0177], Tanaka discloses a method for forming a DRAM structure with a bit line that includes the following features:

- A plurality of silicon gate electrodes (3) are formed over a silicon substrate (0);
- A silicon nitride film (24) is blanket deposited over the silicon gate electrodes (3) to form a cap layer and sidewall spacers;
- A silicon oxide film (25) (i.e. a first dielectric layer) is formed over the silicon nitride film (24);
- A first contact hole (71b) is formed between two neighboring silicon gate electrodes (3) as shown in Fig. 16C;
- The contact holes are formed by first selectively etching the silicon oxide film (25) with respect to the silicon nitride film (24) until the silicon nitride film (24) is

exposed and then etching the silicon nitride with a high etching selectivity until the source/drain regions (6) are exposed as described in paragraph [0117];

- The contact holes are wider at the top than at the bottom (i.e. they are funnel shaped);
- The first contact hole is filled with doped silicon to form a pad (72b) (i.e. a first plug) as shown in Fig. 16F;
- A second silicon oxide film (73) (i.e. a second dielectric layer) is formed over the silicon oxide film (25) and a second contact hole (74) to the pad (72b) is formed through the second silicon oxide film (73) as shown in Fig. 17B;
- The second contact hole (74) has a smaller width than the pad (72b) as shown in Fig. 17B;
- A metal film (78) is formed over the second silicon oxide film (73) to fill the second contact hole (i.e. forming a second plug) as shown in Fig. 17E; and
- The metal film (78) is patterned into a bit line as shown in Fig. 17F and described in paragraphs [0176] to [0177].

These are all of the limitations set forth in claims 1-3, 8 of the applicant's invention.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kim teaches contact openings formed between two conductive

Art Unit: 2813

structures that utilize sidewall spacers. Nulty et al. teach the formation of contact openings between two conductive structures that includes partially removing spacers from the conductive structures. Jiwari teaches the formation of contact openings between two conductive structures that includes exposing shoulders of conductive material.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sws

Stephen W. Smoot
Patent Examiner
Art Unit 2813